Section 1 - Components of a computer

1. Briefly explain the functional role of a processor in a computer system. [2]

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2. Fill in the missing details in the following table: [3]

Name	Role
Data bus	
	Carries processor commands to devices and returns signals from devices to the processor.
Address bus	

3. A processor consists of multiple components, including the arithmetic and logic unit (ALU), control unit and registers.

   a) Circle the three operations that the ALU typically perform: [1]

ADD	**BRANCH**	**STORE**
MULTIPLY	**LOAD**	SHIFT

   b) Briefly explain the function of each of the following registers.

      i. Program Counter (PC) [2]

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      ii. Accumulator (ACC) [2]

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      iii. Current Instruction Register (CIR) [2]

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c) Describe the process of *storing* data to main memory. Identify the registers that are involved. [4]

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4. a) Describe in detail each stage of the Fetch-Decode-Execute cycle.

i. Fetch [3]

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ii. Decode [3]

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iii. Execute [3]

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b) Processor performance is dependent on a number of different factors.

ii. Give three examples of design techniques used to improve processor performance and explain how they provide this improvement. [9]

5. Explain the difference between a Von Neumann architecture and a Harvard architecture. For each architecture give an example of an application the architecture is typically used for. [4]

6. Modern computer systems often contain a multicore processor.

a) Complete the following table stating the resources that are shared by cores in a multicore processor: [2]

Resource	Shared between Cores (Yes/No)
Arithmetic and Logic Unit (ALU)	
Random-access Memory (RAM)	
Network Card	
Program Counter (PC) register	

b) Give one advantage and one disadvantage of rewriting a single-threaded program to take advantage of multiple processor cores. [4]

Advantage: .....

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Disadvantage: .....

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7. Consider the following assembly instruction:

ADDSTA Ra, Rb, Rc	Add the value in Ra to Rb and store the result at the memory location given by Rc.

a) Is the processor with this instruction a CISC or a RISC processor? Explain your reasoning. [2]

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b) Give **two** reasons why RISC processors are often used in portable devices such as mobile phones. [4]

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8. When a processor is powered on it immediately loads a boot program from a ROM (read-only memory). The boot program instructs the processor to load an operating system from a storage device, such as a magnetic hard disk, into RAM (random-access memory).

a) Explain why the boot program is stored in a ROM rather than in RAM. [2]

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b) Instead of being stored using an internal disk, an operating system can be stored on removable media. Name two examples of removable media and one advantage and disadvantage of using each to store an operating system. [4]

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9. A school is considering changing from using paper registers to storing all information on a computer.

a) Name two input devices that could be used to put the data into the computer, and give an advantage of using each one. [4]

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b) The school is considering using a virtual storage system to store the register information.

Describe **two** advantages of using a virtual storage system rather than traditional network-attached storage to store register data. [4]

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Total Marks = / 64